i) Contents

Page 1 : Contents, Introduction, Design.
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Page 5 : Stacking, Handling and Transportation.
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Page 10 : Base & Extension Box Installation.
Page 11 : Extraction of Boxes and Precautions during use.
Page 12 : Pressure Table & Weights for Manhole Box System.

ii) Introduction

This booklet is intended to provide basic information for users of the Mabey Hire Limited 2.5, 3.0, 3.5 & 4.0m Manhole Box System using 98 x 700 spindles and to draw the clients attention to the practical aspects of the manhole box assembly which need to be considered in drawing up method statements for a safe system of work.

In particular, the clients attention is drawn to the size and weights of the Manhole Box components and the need for planning the lifting operations involved.

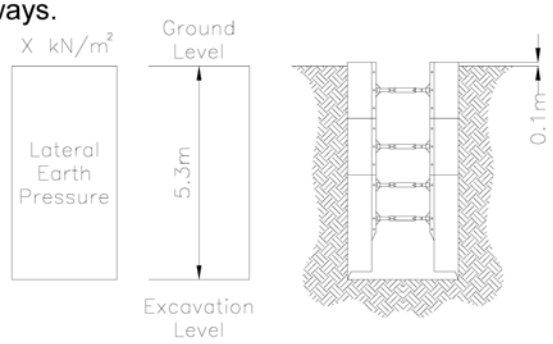
All panels of the Manhole Box System have lifting points for safe slinging when the box is assembled and standing on it's cutting edges. Lifting operations during box assembly require slinging techniques as detailed on pages 6-9.

It is assumed that clients are familiar with general safe practices applicable to this type of work. The Manhole Box is a trench support system for support of trenches up to 5.40m deep. It is not intended for other purposes.

Manhole Boxes should NOT be used in seawater applications without prior consultation with Mabey Hire Limited Engineering Department.

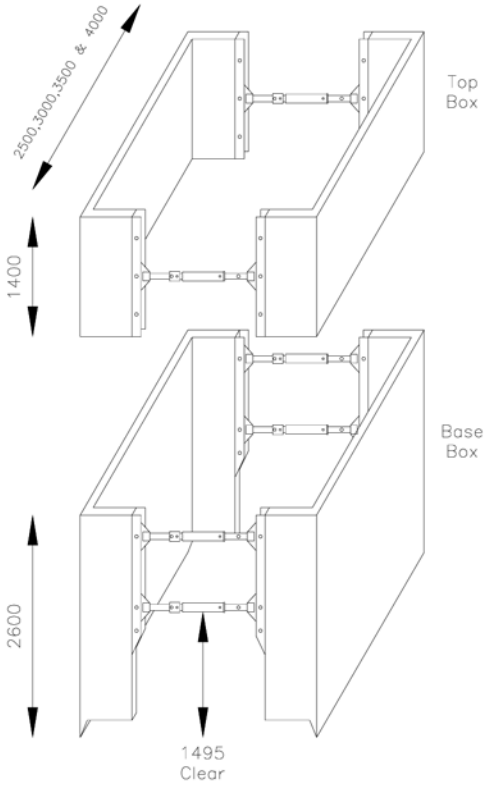
iii) Design

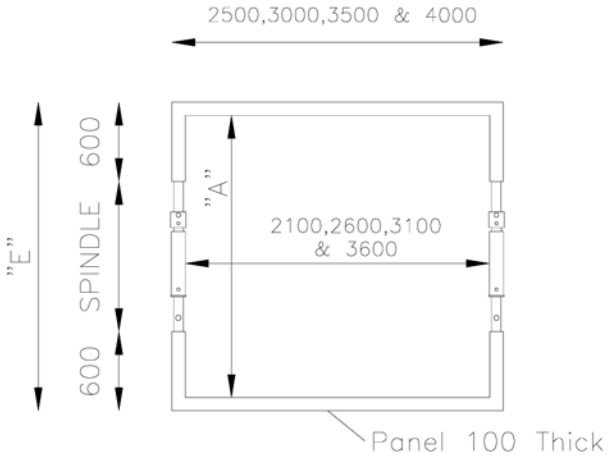
Methods of estimating lateral earth pressures vary. Typical working pressures that the Manhole Box can sustain are as shown in the table on page 12. Please contact Mabey Hire Limited if further assistance is required.
Users are advised to check that their excavation will not impose greater working pressures than these. Conditions that are likely to increase the lateral earth pressure include the close proximity of structures, excavations or construction materials adjacent to the trench and close proximity of site roads and/or railways.



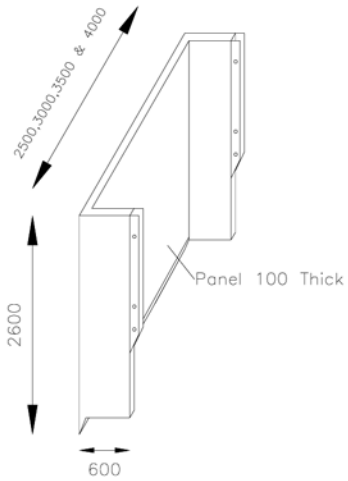
x is dependant on strut length - see table on p12 for appropriate values.

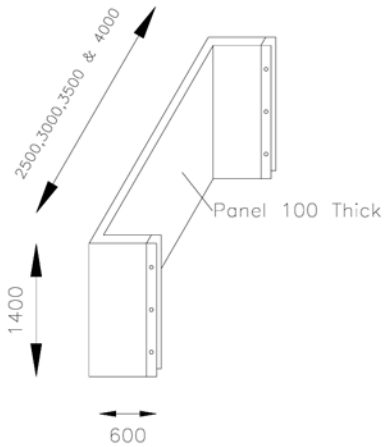
iv) Identification of Components, Dimensions and Weights





a) Panels





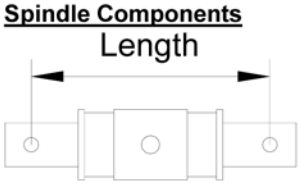
Base Panels

Code - 2.5m - MABO2502 Weight = 940kg
3.0m - MABO3002 Weight = 1041kg
3.5m - MAB03502 Weight = 1142kg
4.0m - MABO4002 Weight = 1243kg

Top Panels

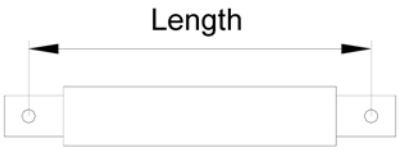
Code - 2.5m - MATO2501 Weight = 512kg
3.0m - MATO3001 Weight = 668kg
3.5m - MATO3501 Weight = 733kg
4.0m - MATO4001 Weight = 801kg

b) Spindle Components **(98 x 700 Spindles)**



Adjustable Spindle

Type	Code	Length (mm)		Weight (Kg)
Mini	KRINMISP	390	460	20
Small	KRINSMSP	515	700	22
Standard	KRINSPIN	700	1030	28



Fixed Spindle

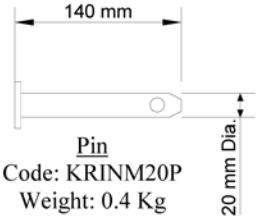
Length (mm)	Code	Weight (Kg)
165	KRIN0500	16
265	KRIN0600	20

Extension Bar

Length (mm)	Code	Weight (Kg)
500	KBAR0500	19
1000	KBAR1000	30

Spring Spindle Holder
Code: KRINSPH
Weight: 13.0 Kg

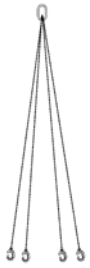
Connector (Top to Base)
Code: KRINCONN
Weight: 5.5 Kg



Pin
Code: KRINM20P
Weight: 0.4 Kg

Pin
Code: KRINM43P
Weight: 2.5 Kg

Accessories



13mm x 4.5m E.L.L. x
4 Leg Chain Sling

Code: CHAIN_ _ _
Weight: 86 Kg
REFER TO LIFTING CHAIN USER INFORMATION FOR FURTHER DETAILS.

19mm x 1.5m E.L.L.
Single Leg Chain

Code: CHAIN_ _ _
Weight: 25 Kg
REFER TO LIFTING CHAIN USER INFORMATION FOR FURTHER DETAILS.

Connection Details

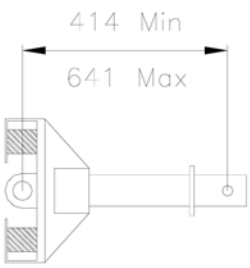
Spindle to Extension Bar	1 No. 20 dia pin (KRINM20P) + 'R' Clip (KRINCLIP)
Spindle to Spring Spindle Holder	1 No. 20 dia pin (KRINM20P) + 'R' Clip (KRINCLIP)
Spring Spindle Holder to Panel	1 No. 43 dia pin (KRINM43P) + 'R' Clip (KRINCLIP)
Connector (Top to Base)	2 No. 43 dia pin (KRINM43P) + 'R' Clip (KRINCLIP)

Spindle Assembly and Adjustment

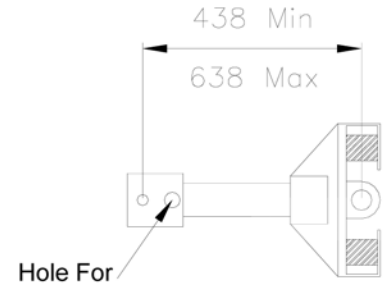
a) When using 98 X 700 spindles only one extension bar per spindle should be used. Should required box width be greater than 2565mm (external dim.) use 98 x 817 spindle.

b) The spindles are mechanically adjustable by inserting a tommy bar into the locating hole in the spindle, and screwing the spindle either in or out as required. It is easier to adjust the spindles if each one is wound in or out a little at a time. The box should be set to the correct width with the cutting edge 50mm wider than the top of the box before the box is placed in the ground.

c) Spindle Components **(98 x 817 Spindles)**



Male Spring Spindle
Code: KSPINNEWM
Weight: 32.5 Kg

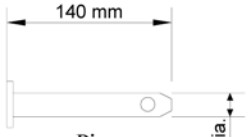


Female Spring Spindle
Code: KSPINNEWF
Weight: 32.5 Kg

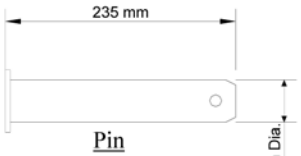
Extension Bar

Length (mm)	Code	Weight (Kg)
500	KB05NEW	21.5
1000	KB100NEW	31.5

Connector (Top to Base)
Code: KRINCONN
Weight: 5.5 Kg

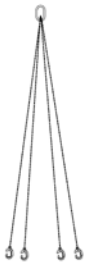


Pin
Code: KRINM20P
Weight: 0.4 Kg



Pin
Code: KRINM43P
Weight: 2.5 Kg

Accessories



Standard Trenchbox
13mm x 4.5m E.L.L. x
4 Leg Chain Sling

Code: CHAIN_ _ _
Weight: 86 Kg
REFER TO LIFTING CHAIN USER INFORMATION FOR FURTHER DETAILS.

19mm x 1.5m E.L.L.
Single Leg Chain

Code: CHAIN_ _ _
Weight: 25 Kg
REFER TO LIFTING CHAIN USER INFORMATION FOR FURTHER DETAILS.

Connection Details

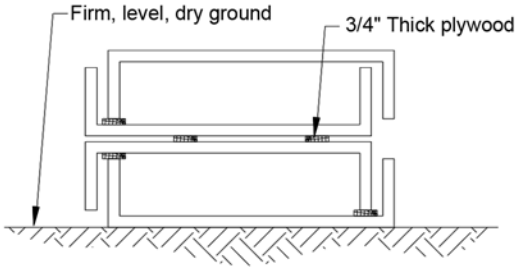
Extension Bar to Spring Spindle Holder	1 No. 20 dia pin (KRINM20P) + 'R' Clip (KRINCLIP)
Spring Spindle Holder to Panel	1 No. 43 dia pin (KRINM43P) + 'R' Clip (KRINCLIP)
Connector (Top to Base)	2 No. 43 dia pin (KRINM43P) + 'R' Clip (KRINCLIP)

Spindle Assembly and Adjustment

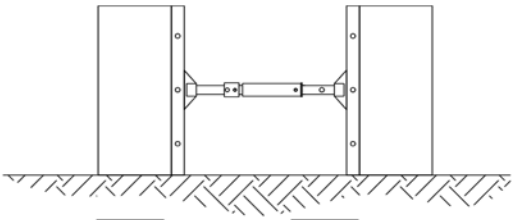
The spindles are mechanically adjustable by inserting a tommy bar into the locating hole in the female spring spindle holder, and screwing the spindle either in or out as required. It is easier to adjust the spindles if each one is wound in or out a little at a time. The box should be set to the correct width with the cutting edge 50mm wider than the top of the box before the box is placed in the ground.

v) Stacking, Handling and Transportation

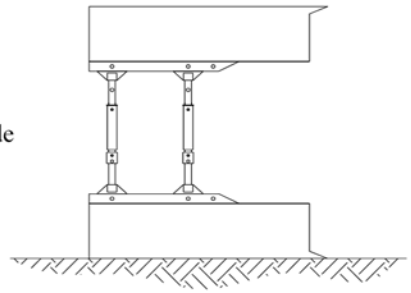
a) In dismantled form and in Transit
Base and top panels should be stacked as shown with suitable timber dunnage (Max. 4 panels per stack).
Strut components, pins and bolts stacked in skips/bins.
During transportation stacks should be securely restrained to the vehicle bed.

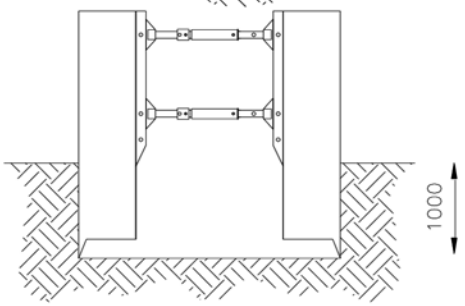


b) In assembled form on-site
If not in use, separate base boxes from top boxes.
Store top boxes upright.



Lie base boxes on their side or leave them temporarily dug in 1m.





viii) Off-Loading & Site Handling of Manhole Box

General Guidance Notes

a) **Manpower**
Health & Safety Regulations require that personnel deployed are suitably trained and experienced and supervised by a competent person.

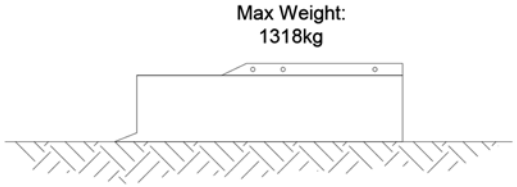
b) **Plant for Lifting**
A suitable appliance is required for off-loading and assembly. The lifting capacity and clearance under the lifting point should be checked against the stages shown below. For narrow boxes an excavator may be suitable. For wider boxes a crane is likely to be required.

c) **Lifting Chains (Available from Mabey Hire Limited)**
Lifting Chains of suitable length & capacity complete with current certification. Typically for Manhole Box a set of 4 leg 13mm chains with 4.5m leg lengths complete with "C" Hooks and shortening clutches.
(Code: CHAIN_ _ _ , Weight : 86kg). REFER TO LIFTING CHAIN USER INFORMATION FOR FURTHER DETAILS.

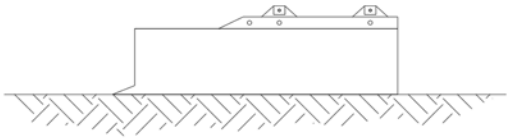
d) **Access and Hard Standing Areas**
These include:
i) Suitable area to off-load the lorry and assemble the manhole box.
ii) Suitable hard standing for the machine to operate from to lift the box into the excavation.
iii) Suitable access equipment (ladder or staging) for connection/removal of lifting chains and pinning panels together (wider boxes only.)
iv) Ladders and possibly other provisions to provide safe access/egress to the excavation.

e) **Return of Equipment Off-Hire**
Clients should ensure than on removal, the equipment is returned in sections as supplied.

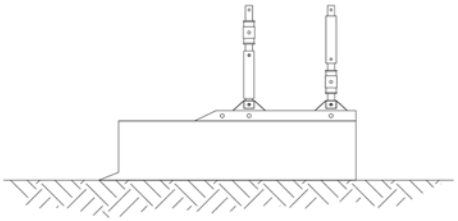
vi) Site Assembly of Base and Extension Boxes - (98 x 700 Spindles) - (Dismantling is Reverse Procedure)



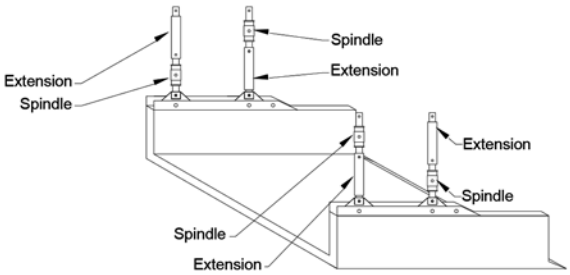
1. Lie base panel flat on ground with spindle connector points upwards.



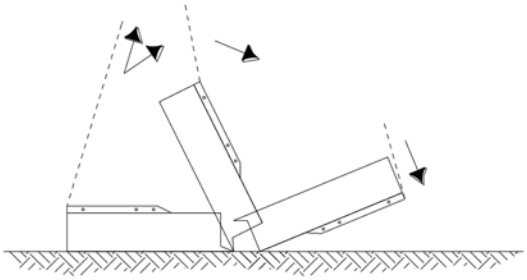
2. Pin into position 4 No. spring spindle holders using 43mm dia pin (KRINM43P) + "R" clips (FRINCLIP)



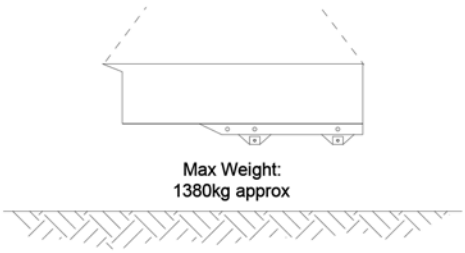
3. Insert the required spindles into the holders and pin into position from above using 20mm dia pins (KRINM20P and "R" clips (KRINCLIP)



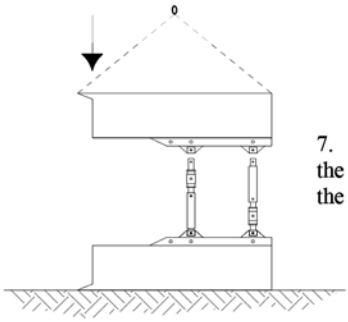
4. Complete assembly of the base box by pinning the spindles into the holders in the first panel using KRINM20P pins and KRINCLIP clips.



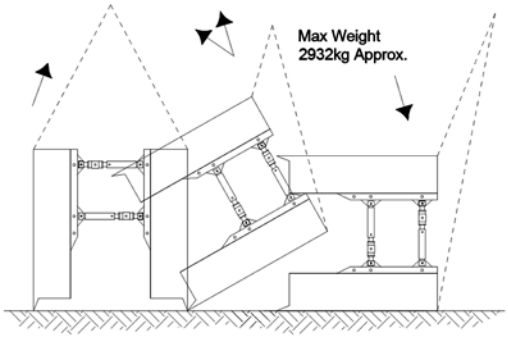
5. Turn the other base panel over using 2 legs of the four leg sling.



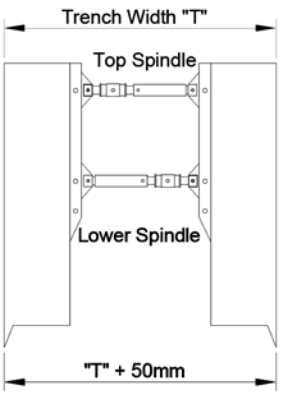
6. Re-sling this panel with the spindle connector points downwards. (Use all for legs of the lifting chain). Pin into position spring spindle holders as in 2. above

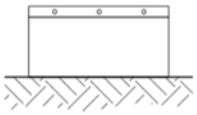


7. Complete assembly of the base box on its side by pinning the spindles to the upper panel using KRINM20P pins & KRINCLIP clips. Do not release the weight of the top panel until all of the pins & clips are in place.

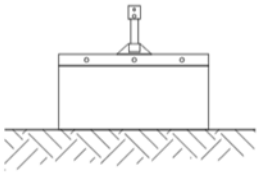


8. Attach 2 chains of sling to UPPER Lifting points on UPPERMOST panel and 2 chains of sling to UPPER lifting points on LOWER panel. Stand the box on its cutting edges with great care to avoid damaging the spindles. It is important that the weights and radius are well within the lifting capacity of the machine to allow for impact and lurching effect as the box is turned upright. The completed base box can now be lifted on 4 chain legs and the spindles extended to their required dimension. Allow for 50mm of "toe-out" at the cutting edges by extending the lower spindle. See section v) for guidance on safe storage.



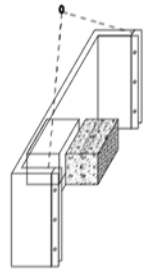


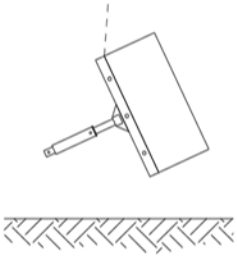
Max Weight: 871kg



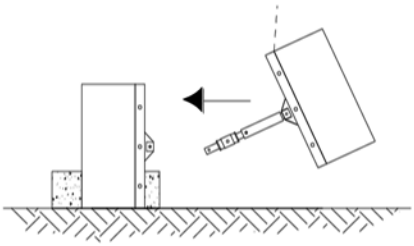
1. Lie first panel on ground with spindle connector points upwards. Pin into position 2 No. spring spindle holders using 43mm dia. pins (KRINM43P) and "R" clips (KRINCLIP). Repeat for the second panel.
Max weight : 871kg Approx.

2. Stand the first top panel upright and securely prop. eg. - between two kentledge blocks. Ensure that the panel is stable before removing the chains.
Max weight : - 801kg Approx.



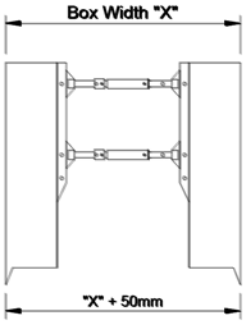


3. Sling the second panel and lift upright. Insert spindles/ extension bars into the holders and pin into position from above using KRINM20P pins and KRINCLIP clips. Ensure spindles/ extension bars are staggered (see page 6)
Max weight: - 1025kg approx.

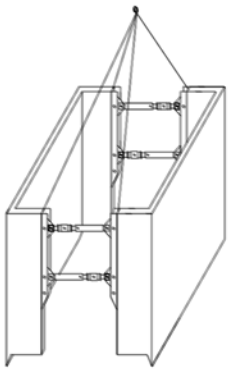


4. Complete assembly of the top box by pinning the spindles into the holders in the first panel using KRINM20P pins and KRINCLIP clips. The top box is now ready to mount onto the base box. See section vii) for guidance on safe storage.

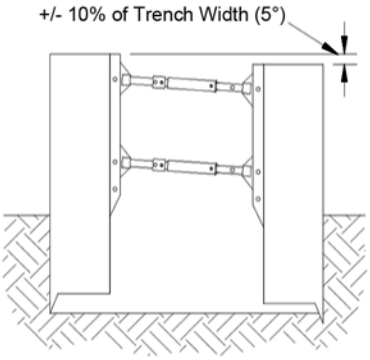
vii) Installation of Manhole Box- Base Box



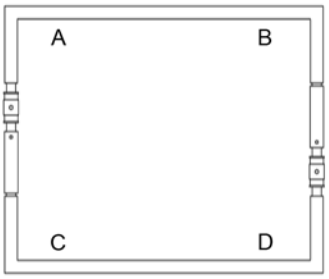
1. After following the Assembly procedure, the box width (x) will already have been set with a "toe out" at the cutting edge of 50mm. Check all pins and safety clips are in place.



2. Lift the box using the 4 leg chain sling attached to the lifting eyes at the top of each Manhole Box panel.
Max. weight : 3111kg approx.

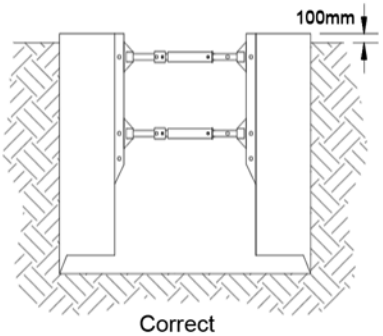


3. Dig the manhole excavation approx. 600-1000mm deep to the correct width, and using the 4 leg chain sling place the box in the trench. by digging between the box panels & pushing down on the ends of the panels, the box can be installed to the correct depth. Always dig below the panels before pushing down. Push only on the corners of each panel and never in the middle. When pushing the box panels down, always push down on each panel in sequence and never diagonally across corners, ie. push A & B followed by C & D & never A & C or B & D.

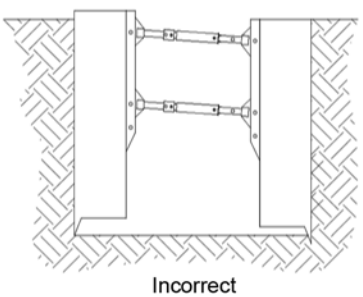


4. During the "Dig & Push" operation 3, restrict the advance of one panel over the other to 10% of the box width.

5. When the required excavation level is reached & the box sunk to full depth, ensure that the struts are horizontal & at right angles to the panels before entering the trench. DO NOT use any unsupported part of the excavation for access. Leave the top of the box 100mm min. above the surrounding ground level.

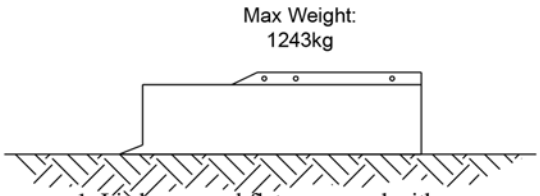


Correct

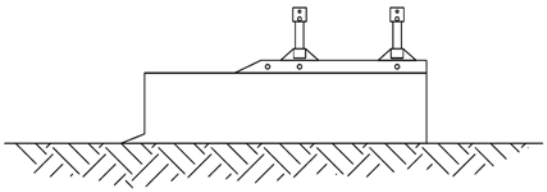


Incorrect

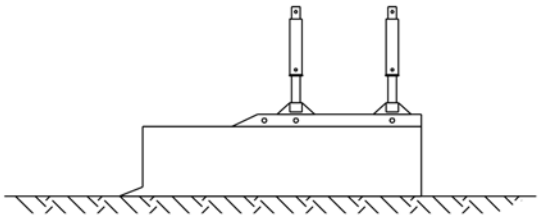
viii) Site Assembly of Base and Extension Boxes - (98 x 817 Spindles) - (Dismantling is Reverse Procedure)



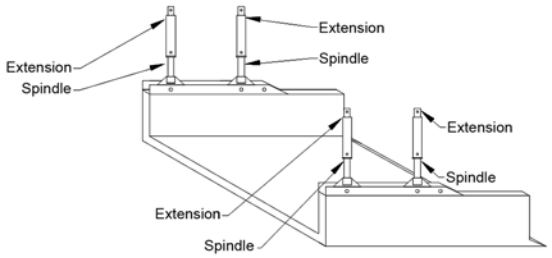
1. Lie base panel flat on ground with spindle connector points upwards.



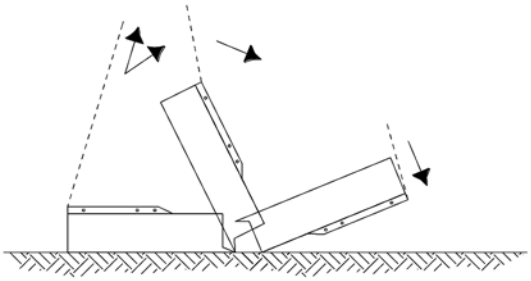
2. Pin into position 4 No. male spindles using 43mm dia pin (KRINM43P) + 'R' clips (KRINCLIP)



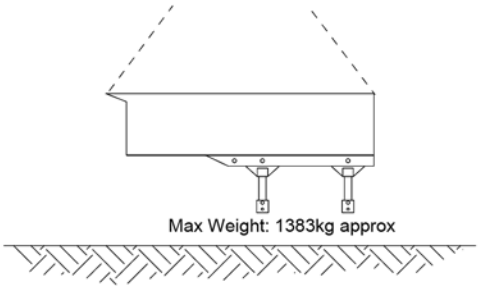
3. Insert the required extensions into the spindles and pin in position from above using 20mm dia. Pins (KRINM20P) + 'R' clips (KRINCLIP)



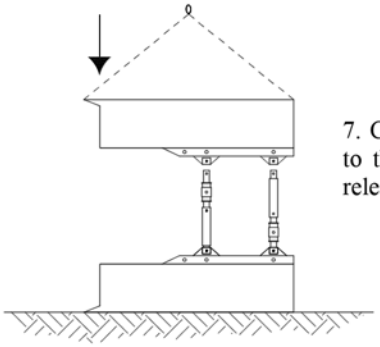
4. Complete assembly of the base box by pinning the spindles into the holders in the first panel using KRINM20P pins and KRINCLIP clips.



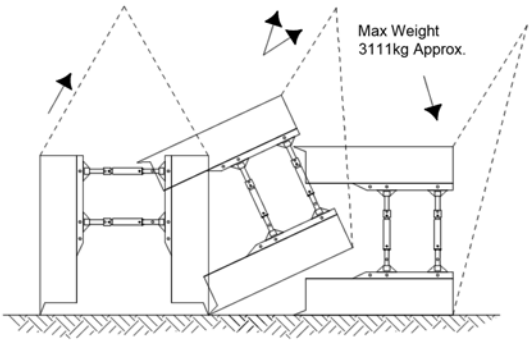
5. Turn the other base panel over using 2 legs of the four leg sling.



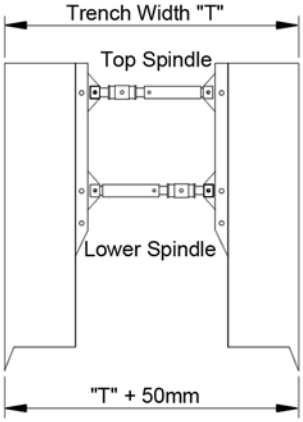
6. Re-sling this panel with the spindle connector points downwards. (Use all for legs of the lifting chain). Pin into position spring spindle holders as in 2. above

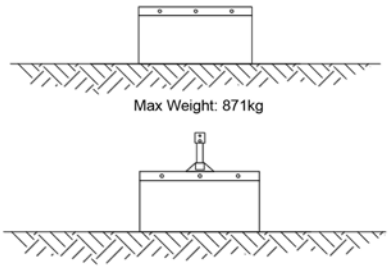


7. Complete assembly of the base box on its side by pinning the spindles to the upper panel using KRINM20P pins & KRINCLIP clips. Do not release the weight of the top panel until all of the pins & clips are in place.



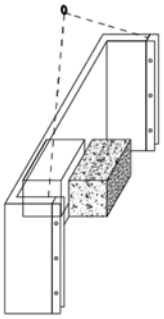
8. Attach 2 chains of sling to Upper Lifting points on UPPERMOST panel and 2 chains of sling to UPPER lifting points on LOWER panel. Stand the box on its cutting edges with great care to avoid damaging the spindles. It is important that the weights and radius are well within the lifting capacity of the machine to allow for impact and lurching effect as the box is turned upright. The completed base box can now be lifted on 4 chain legs and the spindles extended to their required dimension. Allow for 50mm of "toe-out" at the cutting edges by extending the lower spindle. See section v) for guidance on safe storage.

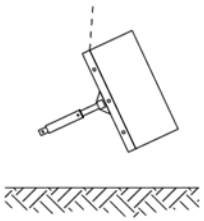




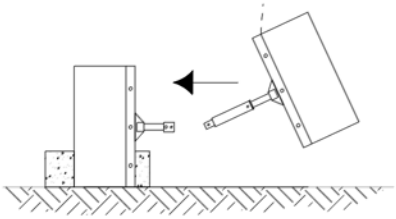
1. Lie first panel on ground with spindle connector points upwards. Pin into position 2 No. male spindle holders using 43mm dia. pins (KRINM43P) and "R" clips (KRINCLIP). Repeat for the second panel. Max weight : 871kg Approx.

2. Stand the first top panel upright and securely prop. e.g. - between two kentledge blocks. Ensure that the panel is stable before removing the chains. Max weight : - 801kg Approx.



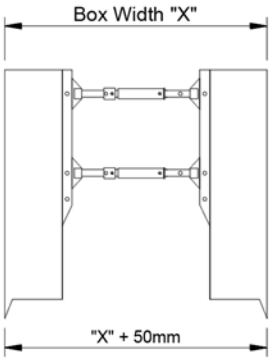


3. Sling the second panel and lift upright. Insert female spindles/ extension bars into the holders and pin into position from above using KRINM20P pins and KRINCLIP clips.
Max weight: - 1025kg approx.

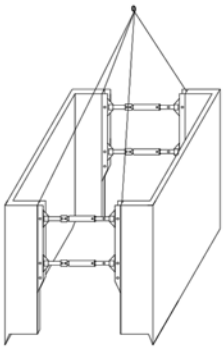


4. Complete assembly of the top box by pinning the spindles into the holders in the first panel using KRINM20P pins and KRINCLIP clips. The top box is now ready to mount onto the base box. See section v) for guidance on safe storage.

ix) Installation of Manhole Box- Base Box

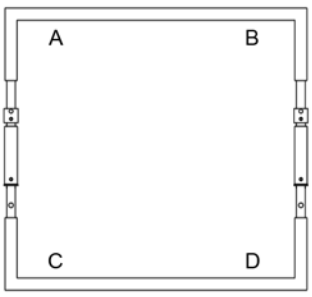


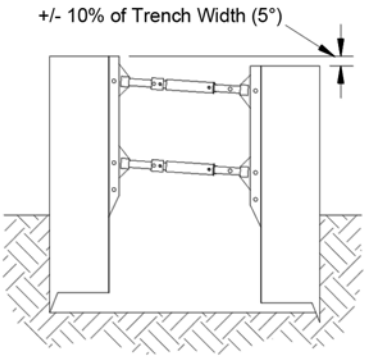
1. After following the Assembly procedure, the box width (x) will already have been set with a "toe out" at the cutting edge of 50mm. Check all pins and safety clips are in place.



2. Lift the box using the 4 leg chain sling attached to the lifting eyes at the top of each Manhole Box panel.
Max. weight : 3111kg approx.

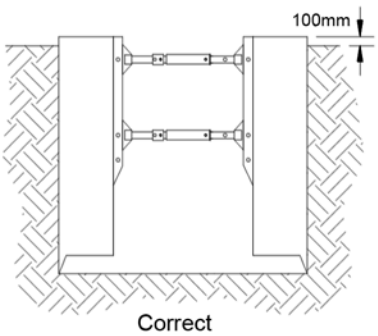
3. Dig the manhole excavation approx. 600-1000mm deep to the correct width, and using the 4 leg chain sling place the box in the trench. by digging between the box panels & pushing down on the ends of the panels, the box can be installed to the correct depth. Always dig below the panels before pushing down. Push only on the corners of each panel and never in the middle. When pushing the box panels down, always push down on each panel in sequence and never diagonally across corners, ie. push A & B followed by C & D & never A & C or B & D.

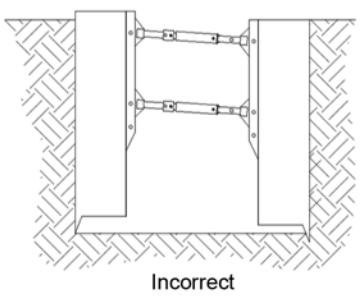




4. During the "Dig & Push" operation 3, restrict the advance of one panel over the other to 10% of the box width.

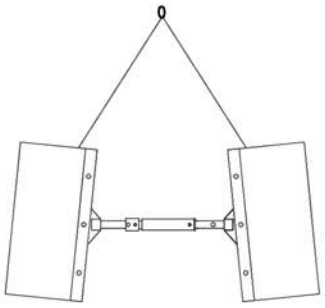
5. When the required excavation level is reached & the box sunk to full depth, ensure that the struts are horizontal & at right angles to the panels before entering the trench. DO NOT use any unsupported part of the excavation for access. Leave the top of the box 100mm min. above the surrounding ground level.

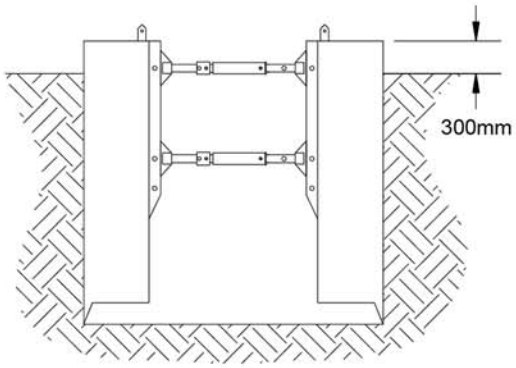




x) Installation of Manhole Box - Top Boxes

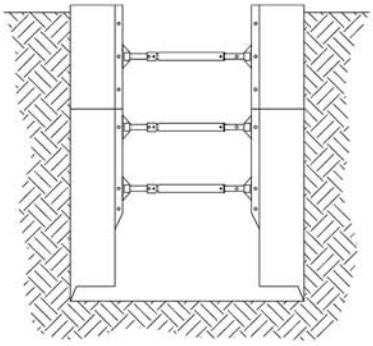
1. Dig & Push Base Box into Excavation to within 300mm of top of base box.
2. Fit 1 No. connector (KRINCONN) at each of the four top corners of the base box using KRINM43P Pins and KRINCLIP Clips.
3. Use 4 leg chain to sling top box into position over base box. (Max. Weight 1824 kg Approx.)
4. Lower one side of the top box into position first. Ensure connectors locate in top panel end posts & pin with KRINM43P pins and KRINCLIP clips.
5. Repeat for second top panel.
6. Repeat steps 1-5 if second top box is required.
7. Do not use boxes with more than 2 top boxes fitted. Ensure that safe ground pressures are not exceeded.



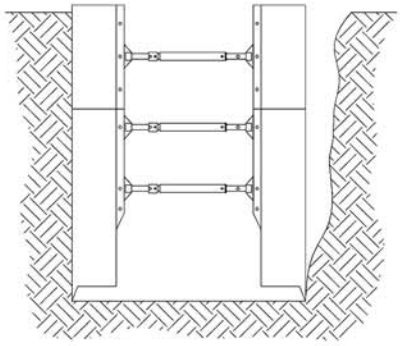


xi) Before Entering Manhole Excavation - (All Boxes)

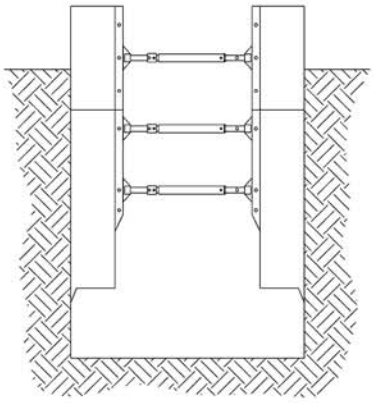
Ensure that there are no voids between the box panel and the excavation sides as this may allow the box to sway sideways.



Correct



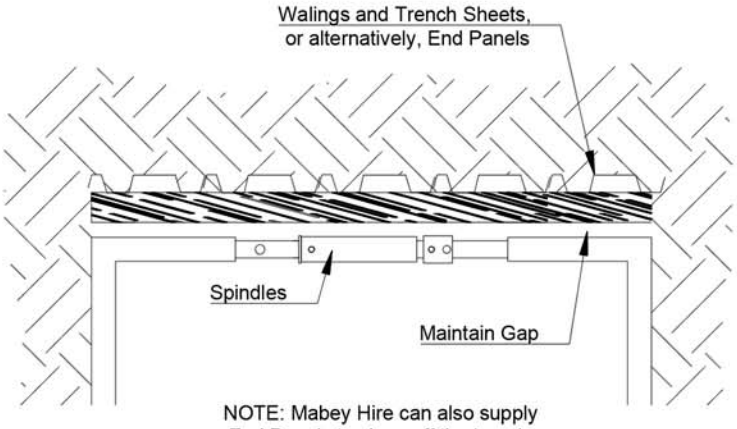
Incorrect



DO NOT leave the base of the box 'flying' above the excavation level.

When stopping off the end of a trench, steel walers should be used to support the sheets off the ends of the panels.

Never use the spindles as supports for the trench sheets.

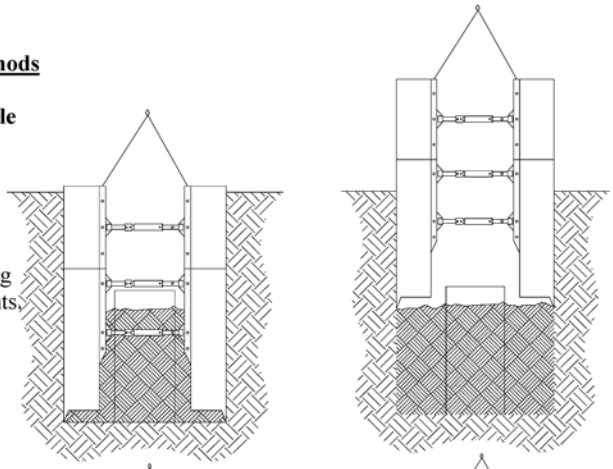


NOTE: Mabey Hire can also supply End Panels to close off the trench.

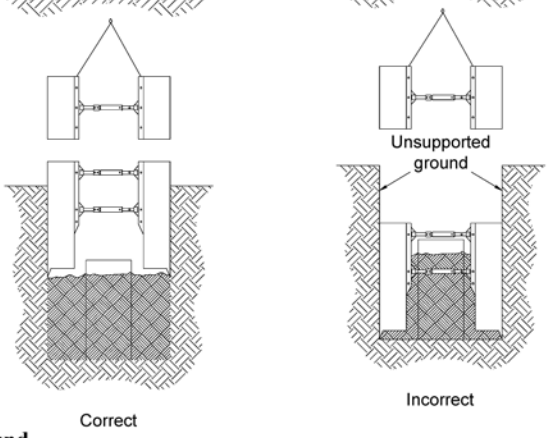
xii) Extraction of Manhole Boxes - Normal Methods

Note:- No personnel should be in the manhole whilst extraction is in progress.

1. After initial back-filling & compaction, lift the base box complete with top box if fitted from the manhole using the 4 leg chain attached to all 4 upper lifting points. Continue back-filling as removal of the box proceeds.

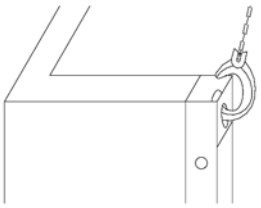


2. Alternatively, if the top box is to be removed from the base box, lift as per 1 until the top of the base box is above G.L. (approx. 300mm). Remove the 4 No. corner connecting pins & lift the top box off the base box. Continue backfilling as removal of the base box proceeds. DO NOT remove the top box before the top of the base box is above G.L.

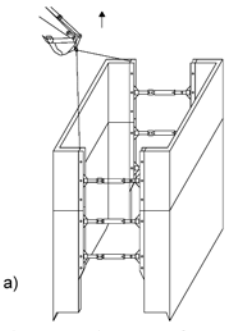


xiii) Extraction of Manhole Boxes in Wet Ground

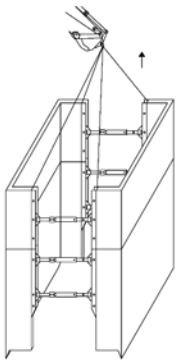
1. In heavy or wet ground it may be necessary to pull one corner of the box at a time to start it moving. Connect the single leg chain to each top lifting point in turn and pull vertically to free the box.
2. Once the box is free, attach 2 legs of the chain sling to the upper lifting points of one panel (a). Pull this panel up & then repeat the operation on the other panel.



NOTE: The advance of one panel over the other should not exceed 10% of the trench width as per installation in section (ix). The box can not be lifted from the trench using the 4 leg chain attached to all the lifting points (b)



a)



b)

xiv) Precautions During Use & Maintenance

1. Regularly check that all pins & "R" clips are fitted.
2. Avoid laterally loading the spindles - either by hanging or propping from them or by accidentally striking them.

General

Since our policy is one of continual improvement, components may vary in detail from the descriptions given in this publication.

xv) **Pressure Table & Weights for Manhole Box System using 98 x 700 Spindles**

2.50, 3.0, 3.5 & 4.0m Manhole Box Using 98 x 700 Spindles

Spindle Type	Extension Bar Length (m)	Nom. Int. Dim "A" (mm)		Nom Ext. Dim "E" (mm)		Weight of Extension Box (2.5m M/H Box) (kg)	Weight of Base Box (2.5m M/H Box) (kg)	Weight of Extension Box(3.0m M/H Box) (kg)	Weight of Base Box (3.0m M/H Box) (kg)	Weight of Extension Box(3.5m M/H Box) (kg)	Weight of Base Box (3.5m M/H Box) (kg)	Weight of Extension Box(4.0m M/H Box) (kg)	Weight of Base Box (4.0m M/H Box) (kg)	Max. Working Pressure "x" (kN/m^2)
		Min.	Max.	Min.	Max.									Max.
98x817	0.0	1952	2352	2152	2552	1317	2312	1629	2514	1759	2716	1893	2918	39.5
	0.5	2452	2852	2652	3052	1361	2400	1673	2602	1803	2804	1937	3006	39.5
	1.0	2952	3352	3152	3552	1381	2440	1693	2642	1823	2844	1954	3046	39.5
	1.0+0.5	3452	3852	3652	4052	1425	2528	1737	2730	1867	2932	2001	3134	39.5
	1.0+1.0	3952	4352	4152	4552	1445	2567	1757	2769	1887	2971	2021	3173	39.5
	1.0+1.0+0.5	4452	4852	4652	5052	1488	2655	1800	2857	1930	3059	2064	3261	39.5
Mini (98 x 700)	0.0	1725	1795	1925	1995	1278	2236	1590	2438	1720	2640	1856	2842	39.5
	0.5	2225	2295	2425	2495	1317	2314	1629	2516	1759	2718	1894	2918	39.5
	1.0	2725	2795	2925	2995	1339	2358	1651	2560	1781	2762	1916	2962	39.5
Small (98 x 700)	0.0	1850	2035	2050	2235	1282	2244	1594	2446	1724	2648	1860	2850	39.5
	0.5	2350	2535	2550	2735	1321	2322	1633	2524	1763	2726	1898	2926	39.5
	1.0	2850	3035	3050	3250	1343	2366	1655	2568	1785	2848	1920	2970	39.5
Standard (98 x 700)	0.0	2035	2365	2235	2565	1294	2268	1615	2470	1736	2672	1870	2874	39.5
	0.5	2535	2865	2735	3065	1333	2346	1645	2548	1774	2710	1910	2950	39.5
	1.0	3035	3365	3235	3565	1355	2390	1667	2592	1797	2794	1932	2994	35.0
Fixed 500	0.0	1500		1700		1270	2220	1582	2422	1712	2624	1848	2826	39.5
Fixed 600	0.0	1600		1800		1278	2236	1590	2438	1720	2640	1856	2842	39.5